STATEMENT OF CONSIDERATIONS

REQUEST BY AIR PRODUCTS & CHEMICALS INC. (APCI) FOR AN ADVANCE WAIVER OF DOMESTIC AND FOREIGN INVENTION RIGHTS UNDER COOPERATIVE AGREEMENT NO. DE-FC26-97FT96052; W(A)-97-035, CH-0938

The Petitioner, Air Products & Chemicals, Inc. (APCI) was awarded this cooperative agreement from an unsolicited proposal. As explained in response to question 2 of the attached waiver petition, the scope of work to be conducted under this project is to develop Ionic Transport Membrane technology to generate synthesis gas (ITM SynGas technology) from bench scale to the point of commercialization. The ITM SynGas Technology will separate oxygen from air through a ceramic membrane and such oxygen will be used to partially oxidize natural gas to form carbon monoxide and hydrogen (together known as synthesis gas or SynGas). SynGas can be used as a feedstock to make liquid transportation fuels and chemicals. Hydrogen can be separated from SynGas and used as an energy source or used to upgrade refinery products. The objective of the initial phase of the project will be to develop ITM materials, catalysts, reactors and reactor seals that are highly functional and durable. ITM fabrication methods will also be developed. During the second phase of the project, the technology elements developed during the initial phase of the project will be integrated into a Process Development Unit that will produce 12 MSCFD of synthesis gas. The ITM SynGas Technology will then be scaled up to a 500-MSCFD Sub-scale engineering prototype plant, which will be built at the DOE-owned Alternative Fuels Development Unit (AFDU) in LaPorte, Texas. In the third and final phase of the project, a 15-MMSCFD ITM SynGas Pre-Commercial Technology Demonstration Unit will be built and operated at the LaPorte AFDU.

The total estimated cost of the subcontract is about $85,157,986. APCI is cost sharing 65.6% of this total estimated cost, or $55,849,155, with the Department of Energy (DOE) providing the remaining $30,000,000. The term is from October 1, 1997 through February 28, 2006. Moreover, APCI will sign a repayment agreement, whereby the U.S. Government will be fully reimbursed for its cost share if inventions made under the cooperative agreement result in successful licensing. Therefore, the grant of this waiver will facilitate APCI's efforts to meet its recoupment obligations under the cooperative agreement with respect to royalty revenue from licensing of the technology

In its response to questions 5 and 6 of the attached waiver petition, APCI has shown that it has established itself as a leader in the gas separation and processing technology industry. In addition, APCI has established collaborations with a project team of private corporations and one U.S. Department of Energy Laboratory to build upon core competencies in ionic ceramic materials science, ceramic fabrication, and process engineering. The team consists of Eltron Research, Ceramatec, Inc., McDermott International Inc., Chevron Research and Technology Company; The Pennsylvania State University, Professor Wayne Worrel, and Pacific Northwest National Laboratory.

As is also brought out in question 5, APCI has established strong commercial positions in membrane technology through its development of proprietary know-how in ceramic membrane materials, membrane testing, membrane fabrication and manufacturing technology, module development, membrane system integration/engineering, and membrane process applications over the last decade. APCI had made significant advances in ITM oxygen

technology covering materials compositions, membrane fabrication techniques, membrane structures, commercially scalable ceramic processing techniques, and novel process cycles and applications, all of which are evidenced by thirty two United States patents, four pending patent applications, as well as numerous invention disclosures. A list of the issued patents is attached to the waiver petition as an appendix.

In response to question 8, APCI will make a substantial investment of financial resources that will directly assist and promote further development of the work through dedicated facilities and financial resources that will be used to convert the syngas product from the ITM pilot and demonstration units into transportation fuels and chemicals.

From its response to question 10, APCI indicates that there would be no effect on competition and market concentration by grant of the waiver because of competition with BP Chemicals, Amoco, and Praxair. APCI states its intent to develop and demonstrate the ITM Syngas technology on the world market, and to enhance the potential to economically recover Alaskan North Slope gas reserves and offshore natural gas.

The subject cooperative agreement will be modified to add the Patent Rights--Waiver clause in conformance with 10 CFR 784.12. This waiver clause will also include a paragraph entitled U.S. Competitiveness, in which APCI agrees to substantial U. S. manufacture of subject inventions (attached hereto). Additionally, APCI agrees not to transfer subject inventions to any other entity unless that other entity agrees to these same requirements. The petitioner has further agreed to modification of the data clause of the subject cooperative agreement (48 C.F.R. 952.227-14) by adding paragraph (k), Alternative VI, concerning contractor licensing of data.

Considering the foregoing, it is believed that granting the waiver will provide the Petitioner with the necessary incentive to invest their resources in the commercialization of the results of the agreement in a fashion which will make the agreement's benefits available to the public in the shortest practicable time. In addition, it would appear that grant of the above requested waiver would not result in an adverse effect on competition nor result in excessive market concentration. Therefore, in view of the objectives and considerations set forth in 10 CFR 784, all of which have been considered, it is recommended that the requested waiver, as set forth above, be granted.

[redacted]

Mark P. Dvorscak
Assistant Chief Counsel
Office of Intellectual Property Law
Date Sept 29, 1999

Based on the foregoing Statement of Considerations and the representations in the attached waiver petition, it is determined that the United States and the general public will best be served by a waiver of rights and consent to assignment of the scope described above, and therefore the waiver is granted. This waiver shall not apply to any modification or extension of this agreement, where through such modification or extension, the purpose, scope, or cost of the agreement is substantially altered.

CONCURRENCE:

[redacted]

Guido DeHoratiis
Director, Natural Gas
and Petroleum Technologies

Date 7/25/00

APPROVAL:

[redacted]

Paul A. Gottlieb
Assistant General Counsel
for Technology Transfer and
Intellectual Property

Date 7-31-00

(t) U. S. COMPETITIVENESS The Contractor agrees that any products embodying any waived invention or produced through the use of any waived invention will be manufactured substantially in the United States unless the Contractor can show to the satisfaction of the DOE that it is not commercially feasible to do so. In the event the DOE agrees to foreign manufacture, there will be a requirement that the Government's support of the technology be recognized in some appropriate manner, e.g., recoupment of the Government's investment, etc. The Contractor agrees that it will not license, assign or otherwise transfer any waived invention to any entity unless that entity agrees to these same requirements. Should the Contractor or other such entity receiving rights in the invention undergo a change in ownership amounting to a controlling interest, then the waiver, assignment, license, or other transfer of rights in the waived invention is suspended until approved in writing by the DOE.